

ENGINEERING CHEMISTRY

Ques

of wood as fuel and its employment is only justified when coal is not obtainable or only at a prohibitive price. The calorific value of air-dried wood may be reckoned at 7400 B.Th.U. gross, but, since the large amount of water in its cells and formed by its combustion must be gasified at the expense of the liberated heat, this figure presents an altogether too favourable view of its value in relation to the more concentrated fuels.

Lignites or brown coals are geologically more recent than the true coals. They contain larger percentages of hydrogen and oxygen, and in consequence of the latter have generally a considerably lower heating power than coals with the same amount of ash. The water present in the air-dried fuel is generally high, and, for the reasons stated under wood although in a less degree, the low or net calorific value has generally a lower ratio to the gross than in the case of coals. When cheaply mined, lignites constitute a valuable source of heat, and they are extensively employed on the continent of Europe and elsewhere, many industries being dependent on them; but, in competition with coal, they will bear transit: charges only over a limited range. They are of no importance in Great Britain, but are largely found in Western America and Canada. The following exemplify the composition of this class of fuel:

	General Composition				Lignites of Istria	
	of Organic Matter.				and Dalmatian.	
					Per cent.	
	Carbon	(15	63-35
	Hydrogen	7	4.83
	- Oxygen			 2.8 12-49
	Nitrogen	1.31
	Sulphur	-	8-08
	Ash.....	—			9-94
	Water		----	1-56
				100		101-56
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Goal.—Coals consist of the altered remains of vegetable growths, generally intermixed with more or less earthy matter. The ash of coal is constituted of these foreign earthy bodies along with a small amount of mineral matter derived from the constituent substances of the plants. Three types of mineral predominate in that; portion of the ash

which is accidental, namely siliceous bodies resembling clay, carbonates of lime and magnesia, and iron pyrites. What may be designated the inherent mineral constituents of the coal substance are generally rich in oxide of iron. The proportions of these elements of the ash have considerable influence on the behaviour of the fuel containing it in the furnace. (See *Coal ash*, p. 36.)

The combustible matter of coal consists of a mixture of substances of complex chemical composition. Derived for the most part from leaves, spores and spore cases, and the like, and scarcely to any extent apparently from the cellulosic or woody constituents of plants, the material has, as the result of fermentative action, assumed new combinations, the nature of which is still obscure. The mother substance of a part of the organic matter of coal